Analysis of the Isotopic Composition of Deutero-organic Compounds by Means of Infrared Absorption Spectra

SOV/48-23-10-20/39

the low concentration of impurities; if, e.g., it is possible to determine concentration with an error of 10%, this figure will amount to 0.2% if the mixture contains 2% impurities. The analysis of the isotopic composition of deutero-organic compounds will become much more simple if molecules containing an X-D-group are to be analyzed. In this case analysis is carried out according to bands of molecules which contain no deuterium at all. By employing this method the author investigated $CDCl_3$, C_6H_5D, CH_3OD and CH_3COOD. In the first the $CHCl_3$-impurities were determined according to the CH-valence vibration band (3028 cm^{-1}), a control was carried out by means of the CH-deformation vibration band (1200 cm^{-1}). The result obtained by means of the first-mentioned band was (99.08±0.07)% $CDCl_3$, and that by means of the second: (99.11±0.10)%. The analysis of the monodeuteron benzene was carried out according to the bands of the C_6H_6-molecule (2211 and 674 cm^{-1}). Determination of the concentration of CH_3OD was carried out according to the OH-

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Analysis of the Isotopic Composition of Deutero-organic Compounds by Means of Infrared Absorption Spectra

SOV/48-23-10-20/39

valence vibration band in the CH_3OH-molecule (3330 cm^{-1}). Also in the CH_3COOD-analysis the OH-valence vibration band was used, as also the absorption band of CH_3COOH at 1128 cm^{-1} and the OH-deformation vibration band (974 cm^{-1}). The results were in good agreement. In a deuteronmethane analysis, CHD_3 bands ($2990, 2140, 1035 \pm 5,$ and 1002 cm^{-1}) and a weak CH_2D_2 band (1238 cm^{-1}) were found besides the CD_4 bands. The author finally thanks V. M. Chulanovskiy for his interest in this work.

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo
               gos. universiteta im. A. A. Zhdanova (Scientific Research
               Institute of Physics of the Leningrad State University imeni
               A. A. Zhdanov)

Card 3/3

BULANIN, M.O.; ORLOVA, N.D.

Infrared absorption spectra of hydrogen in solutions. Opt.i
spektr. 11 no.4:551-553 O 'ol.   (MIRA 14:10)
     (Hydrogen--Spectra)   (Infrared rays)

BULANIN, M.O,

STRUCTURE AND PHYSICAL PROPERTIES OF MATTER IN A LIQUID STATE
reports read at the 4th Conference convened in KIYEV from 1 to 5 June
1959, published by the publisher House of KIYEV University, KIYEV,
USSR, 1962

AI

AUTHORS: Chulanovskiy, V. M., Bulanin, M. O., Denisov, G. S., Shuva-
              lova, Ye. V., and Shchepkin, D. N.

TITLE: Effect of the solvent on the infrared spectrum of the substance,
              and its consideration in analytical work

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26,
              no. 10, 1962, 1230 - 1236

TEXT: The variation in the spectrum of a solvent in the presence of a
dissolved substance, and thus also of its absorption coefficient, is dis-
cussed on the basis primarily of Western publications. Reference is made
to a paper by M.-L. Josien et al. (Compt. rend. Acad. sci., 249, 256 (1959))
concerning the dependence of symmetrical and asymmetrical vibrations of the
CH_2 group in CH_2Cl_2 on the concentration, confirmed experimentally by the
present authors. The 3630 cm^{-1} which characterised the formation of H
bonds was found for methyl alcohol, just as it had been found for benzyl
alcohol by J.J. Fox, A. E. Martin (Trans. Farad. Soc., 36, 897 (1940)). In
contrast to M. Van Thill, E. D. Becker, J. C. Pimentel (J. Chem. Phys., 27,
Card 1/2

Effect of the solvent on the infrared ...   S/048/62/026/010/002/013
                                             B101/B186

95 (1957)), the splitting of the 3340 and 3520 cm^{-1} bands of methanol dissolved in N_2 at 20°K is not attributed to different types of molecular associations but to different types of H bonds. On the other hand, it was found in the author's laboratory that the stretching vibration band of the NH group in diethyl or dimethyl amine was a singlet, which is explained by different distributions of electrons in the alcohol and the amine. The formation of different types of associations of the oxygen atom was observed for the C=O band of ketones dissolved in hexane after addition of chloroform. With camphor, all three bands of the carbonyl group successively appear with increasing concentration of chloroform: one band for the monomer group and two for the associated group. Such types of intermolecular bonds are compared with coordination bonds, and are explained by incomplete saturation of atoms in the molecule. There are 5 figures.

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L 17788-63   EWT(1)/EWP(q)/EWT(m)/BDS   AFFTC/ASD/IJP(C)   JD

ACCESSION NR: AP3005843   S/0051/63/015/002/0208/0215

AUTHOR: Bulanin, M.O.; Orlova, N.D.

TITLE: Infrared absorption band contours and rotational motion of molecules in liquids. Solutions of carbon monoxide.

SOURCE: Optika i spektrokopiya, v.15, no.2, 1963, 208-215

TOPIC TAGS: molecular rotation, band shape, infrared absorption, intermolecular coupling, CO

ABSTRACT: Interaction between molecules may affect all the characteristics and particularly the shape of their infrared absorption bands. Hence systematic study of the shape of IR absorption bands of liquids and solutions, eapecially as compared with the band shape for the same substance in the vapor state, should yield information on the structure of the intermolecular field and the factors responsible for the changes occurring incident to the gas-to-condensed phase transition. It was shown earlier (M.O.Bulanin and N.D.Orlova, Optika i spektro.,4, 569, 1958) that the rotational motion of molecules in liquid solutions may, under certain conditions, be evinced in the shape of the absorption bands. This has been

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L 17788-63

ACCESION NR: AP3005843

substantiated by many investigators. The present work was devoted to investiga-
tion of the vibrational-rotational band of carbon monoxide in solutions. For such
studies, the CO molecule has the advantages of being simple, having a small dipole
moment ($\mu = 0.112$ D), and exhibiting little tendency to form complexes with sol-
vent molecules. In view of the low solubility of CO in liquid solvents, a special
high pressure absorption cell was designed for the experiments. The layer thick-
ness was varied from 0.7 to 4.0 mm. The spectra were recorded by means of an in-
frared spectrometer with 200 lines/mm diffraction grating. The spectra were stu-
died in many different solvents, including normal hexane, heptane and octane, a
foran fraction, carbon and silicon tetrachloride, butyl bromide, benzene, chloro-
form, methylene chloride and bromoform at room temperature and liquid oxygen at
about 90°K. The spectra in a few solvents are shown in a figure, and the frequen-
cies of the P, Q and R components composing the complex structure of the CO band
are tabulated. The values of the difference between the intensities of the P and
R components and the separation between them are plotted as a function of the so-
lubility parameter δ. The CO band in liquid oxygen, in contrast, has no side
peaks, i.e., exhibits only the Q component. The origins of the side components
in the solution spectra are discussed in terms of a potential barrier hindering
transitions. The frequency values obtained in the present experiments are in

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L 17788-63
ACCESSION NR: AP3005843

agreement with the results of other authors. "The authors are grateful to V.M. Chulanovskiy for his interest and assistance in the work. We also thank G.Wilse Robinson and D.C.McKean for sending copies of their papers prior to publication." Orig.art.has: 8 formulas, 4 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 02Jan62

SUB CODE: PH

DATE ACQ: 06Sep63

NO REF SOV: 009

ENCL: 00

OTHER: 029

Card 3/3

BULANIN, M.O.; TONKOV, M.V.

Contours of infrared absorption bands and the rotational motion
of molecules in liquids in liquids. Methyl halides and deuteromethyl
halides. Opt. i spektr. 16 no.3:429-435 Mr '64. (MIRA 17:4)

ACCESSION NR: AP4039705   S/0051/64/016/006/0987/0991

AUTHORS: Bulanin, M. O.; Peterson, Yu. V.

TITLE: Study of the infrared spectra of liquid oxygen and nitrogen

SOURCE: Optika i spektroskopiya, v. 16, no. 6, 1964, 987-991

TOPIC TAGS: liquid oxygen, 'liquid nitrogen, infrared spectrum, infrared absorption, spectral analysis

ABSTRACT: In view of the paucity of published data on the subject, and in view of the possible use of infrared spectra for the detection of impurities in liquid gases, the authors have obtained the infrared absorption spectra of commercial liquid oxygen and nitrogen in the $3500-1200$ cm^{-1} region, using a specially constructed low-temperature cell. The operating procedure is described and some difficulties involved in the construction of cryostats for the investigation of infrared spectra are discussed. The spectra obtained are interpreted.

Card 1/5

ACCESSION NR: AP4039705

The spectrum of commercial liquid nitrogen had no impurity absorption bands, with the exception of a broad band due to induce absorption of oxygen with a maximum near 1560 cm^{-1}. Liquid oxygen exhibited several lines which could be attributed only to impurities in the commercial oxygen. It is shown that solutions of acetylene in liquid oxygen have a complex construction. Possible explanation of the observed spectra are discussed. "The authors are grateful to V. M. Chulanovskiy for continuous interest and attention to this work." Orig. art. has: 4 figures and 1 table.

ASSOCIATION: None

SUBMITTED: 08Aug63   DATE ACQ: 24Jun64   ENCL: 03
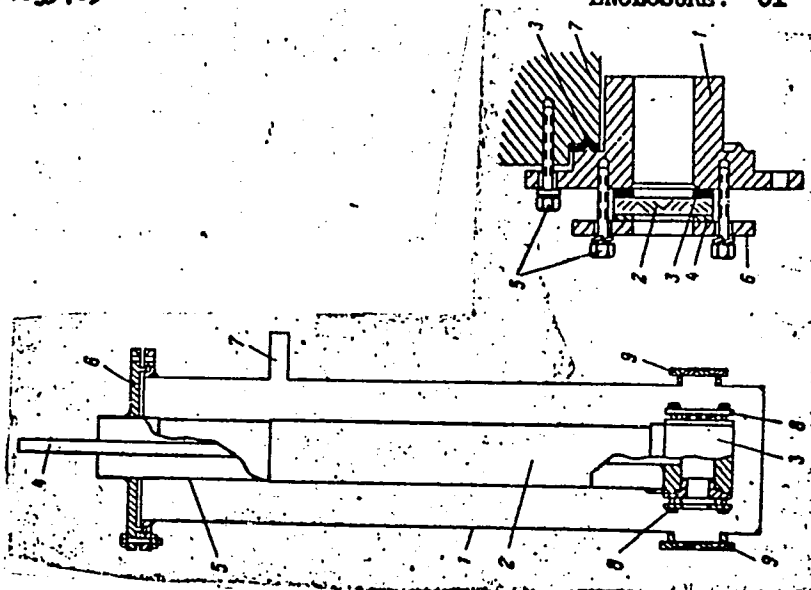
SUB CODE: OP   NR REF SOV: 004   OTHER: 013

Card 2/5

ACCESSION NR: AP4039705

ENCLOSURE: 01

Card   3/5

ACCESSION NR: AP4039705

ENCLOSURE: 02

Construction of cell and
frames of head windows

1 - copper housing
2 - vessel, stainless steel
3 - brass head
4 - stainless steel tube
5 - top of vessel
6 - flange
7 - tube
8, 99 - fluorite windows

Card 4/5

Frequencies and interpretation of absorption bands
in infrared spectrum of technical liquid oxygen

1	2	1	2	1	2
Частота, см⁻¹	Интерпретация	Частота, см⁻¹	Интерпретация	Частота, см⁻¹	Интерпретация
1286	N_2O	2458	N_2O	3015	CH_4
1310	CH_4	2560	N_2O	~3100	O_2
1560	O_2	2862	CH_2-группы	3225	C_2H_2 (кристал-
2219	N_2O	2873	C_2H_6		лическая фа-
2275	?	2935	C_2H_6		за)
~2340	N_2	2962	C_2H_6	3276	} C_2H_2
				3286	

1. - frequency, 2 - intepretation 3 - groups,
4 - crystalline phase

Card 5/5

BULANIN, M.O.

Labors of the International Committee on Molecular Structure
and Spectroscopy. Opt. i spektr. 16 no.6:1069-1070 Je '64.
(MIRA 17:9)

BULANIN, M.O.; ORLOVA, N.D.

Induced infrared spectrum of hydrogen in solution in the region of
2 ←0 vibrational transition. Dokl. AN SSSR 163 no.1:137-139 Jl '65.
                                                      (MIRA 18:7)
1. Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gosudar-
stvennogo universiteta im. A.A.Zhdanova. Submitted January 18, 1965.

L 5428-66   EWT(m)/EPF(c)/EWP(t)/EWP(b)   IJP(c)   JD

ACCESSION NR: AP5019754

AUTHOR: Bagdanskis, N. I.; Bulanin, M. O.

TITLE: The inversion of ammonia molecules in solution

SOURCE: Optika i spektroskopiya, v. 19, no. 2, 1965, 229-234

TOPIC TAGS: ammonia, line splitting, molecular spectrum, solution property

ABSTRACT: In view of the contradictory data on the inversion of ammonia in the condensed phase, the authors have calculated the perturbing effect of an Onsager field on this inversion. The parameters of the inversion potential function of NH_3 are determined by using the Bell-Onsager model, according to which the molecule-solvent system is represented as a spherical surface in a continuous dielectric. The height of the potential barrier and the magnitude of the inversion splitting of the fully symmetrical deformation vibration of ammonia are then calculated for some liquid and solid solutions, and the results are compared with the existing experimental data. The results show that the inversion splitting decreases rapidly with increase of the dielectric constant of the solvent, becoming practically unobservable when the dielectric constant exceeds 2. It is pointed out in the conclusion that the results are based on a very simple model and on many simplifying assumptions, and must therefore be regarded as only semiquantitative. "The authors thank

Card 1/2

L 5428-66

ACCESSION NR: AP5019754

V. M. Chulanovskiy for continuous interest." Orig. art. has: 2 figures, 10 for-
mulas, and 1 table.

ASSOCIATION: none

SUBMITTED: 10Jun64

NR REF SOV: 002

ENCL: 00

OTHER: 030

SUB CODE: IC, GC, OP

Card 2/2

BORGEST, V.A.; BULANIN, M.O.; ORLOVA, N.D.

Shape of the infrared ν_3 band of methane dissolved in liquid oxygen and liquid nitrogen. Opt. i spektr. 18 no.6:1073-1074 Je '65.

(MIRA 18:12)

BUKANIN, V. I.

"Problem of the Expansion of a Compressed Fluid in a Diagonal Section of a Nozzle," Iz. Ak. Nauk SSSR, Otdel. Tekh. Nauk, No 1, 1941. Submitted 5 May 1940.

1. BULANIN, V. I.

2. USSR (600)

4. Steam Turbines--Standards

7. Standardization of parts and assemblies for steam turbines, Vest. mash., 33, No. 1, 1953.

9. Monthly List of Russian Accessions, Library of Congress, ___April,___ 1953, Uncl.

BULANIN, V.I., dotsent

"Shock" losses in flow through a turbine cascade. Trudy LPI no.2:41-48 '54.   (Turbines) (Gas flow)   (MIRA 8:8)

BULAT, V. I.

"On the Problem of the Evaluation of Turbine Cascades," Dr. Leningr. Politekhn. in-ta, No 2, pp 49-56, 1954

Points out that the difference between the static pressure discharge from the cascade and the atmospheric pressure, called "under expansion" (nedorasshirenlye) by the author, is not included in the size of the losses. (RZhMekh, No 5, May 55)

Sum. No. 681, 7 Oct 55

BULANIN, V.I.; GUR'YEV, V.P.

Construction of turbomachines during the sixth five-year plan.
Trudy LPI   no.187:5-26 '56.   (MIRA 13:6)
                (Turbines)

BULANIN, V.I.

Areas of use of surface-type condensers. Trudy LPI   no.187:110-123
'56.
            (Condensers (Steam))   (MIRA 13:6)

BULANIN, V. I.

Dissertations on power machinery manufacture (review of dissertations submitted in 1954 and 1955). Trudy LPI no.187:184-192 '56.

(Bibliography--Power engineering)   (MIRA 13:6)

BULANIN, V.I., kand. tekhn. nauk; AVER'YANOV, N.N., nauchnyy red.;
VASIL'YEV, A.V., red. izd-va; GURDZHIYEVA, A.M., tekhn. red.

[Leningrad -- city of technical progress] Leningrad - gorod
tekhnicheskogo progressa. Leningrad, Ob-vo po rasprostraneniiu
polit. i nauchn. znanii RSFSR, Leningr. otd-nie, 1957. 27 p.
                    (Leningrad)
                                              (MIRA 11:9)

89056
S/124/61/000/002/003/007
A005/A001

26.2120

Translation from: Referativnyy zhurnal, Mekhanika, 1961, No. 2, p. 42, # 2B266

AUTHOR: Bulanin, V.I.

TITLE: The Determination of the Optimum Parameters for the Rated Conditions of Composite Gas-Turbine Units

PERIODICAL: "Nauchn.-tekhn. inform. byul. Leningr. politekhn. in-t", 1957, No.9, pp. 26 - 38

TEXT: The author expounds an analytical method for determination of para-meters of a gas-turbine unit with a complicated cycle, which ensure the maximum efficiency of the unit. The method makes it possible to determine relatively rapid-ly not only the optimum parameters, but also to state the effect of any characteri-stic as well as of an individual property of the gas-turbine unit or its main com-ponents (the degree of regeneration, the intensity of intermediate cooling, the ef-ficiency of the main components, etc) on the optimum parameters and, consequently, on its economy. The method comes to the constitution of the fundamental equations of the connection between the parameters of the gas-turbine unit, in the most simple case on the basis of the equations of the balance of power (duty) and the

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89056

S/124/61/000/002/003/007
A005/A001

The Determination of the Optimum Parameters for the Rated Conditions of Composite Gas-Turbine Units

heat quantity for any operation mode of the unit. If the efficiency of any gas-turbine assembly is determined by n parameters, S of which are dependent parameters, and $m = n - S$ are independent parameters, the author derives, by using these fundamental equations, the expressions for some coefficients. Equating them to zero yields those additional equations which, together with the fundamental equations of connection between the parameters, form a system of n equations with n unknown optimum parameters. The expressions for the coefficients are obtained from the expression of the total differential of the efficiency (in terms of the differentials of all parameters) by means of the substitution of the differentials of dependent variables in them with the differentials of independent variables. Comparative calculations of the efficiencies of two gas-turbine assemblies of different operation modes are presented, and the corresponding correlations are given graphically obtained by the method considered.

V. Kostylev

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

GEL'TMAN, A.E., kand.tekhn.nauk; KANAYEV, A.A., kand.tekhn.nauk; TSUKERMAN,
R.V., kand.tekhn.nauk; BULANIN, V.I., kand.tekhn.nauk, nauchnyy
red.; VLADIMIRSKIY, D.M., red.izd-va; GURDZHIYEVA, A.M., tekhn.red.

[Heat-power machinery manufacture in the sixth five-year plan]
Teploenergomashinostroenie v shestoi piatiletke. Leningrad,
Obshchestvo po rasprostraneniiu polit.i nauchn.znanii RSFSR,
Leningr.otd-nie, 1958. 29 p.   (MIRA 12:3)
          (Turbines)   (Boilers)

SOV/112-59-18-39732

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1959, Nr 18, p 20 (USSR)

AUTHORS: Bulanin, V.I., Orlov, K.V.

TITLE: Investigation of the Operating Conditions of Two-Shaft Gas Turbine Installations at Partial Loads (Preliminary Information)

PERIODICAL: Nauchn.-tekhn. inform. byul. Leningr. politekhn. in-t, 1958, Nr 3, pp 130 - 139

ABSTRACT: The calculation results for variable conditions of two layouts of two-shaft gas turbine installations of 25 Mw with two combustion chambers for liquid fuel, intermediate cooling between two compressors and with low-pressure turbine for the drive of the generator. The calculations were carried out by employing the linearization method of equations, describing the operation of the installation and the characteristics of the single aggregates. The resulting curves of the change in performance, coefficient of useful capacity, air consumption, and the number of revolutions for regeneration degrees of 0.5 and 0.8 are stated. For both of the chambers a

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SOV/112-59-18-38032

Investigation of the Operating Conditions of Two-Shaft Gas Turbine Installations at
Partial Loads (Preliminary Information)

minimum fuel consumption is taken (1,000 kcal/sec) which makes it necessary at partial
loads to depart from the optimum control program. The characteristics of both these
layouts are analyzed. 5 references.

V.D.S.

Card 2/2

AUTHOR: Bulanin, V.I.   SOV/96-58-2-7/22

TITLE: A Method of Determining the Optimum Parameters of Gas-
            Turbine Installations (Sposob opredeleniya optimal'nykh
            parametrov gazoturbinnykh ustanovok)

PERIODICAL: Teploenergetika, 1958, Nr 3, pp 32-38 (USSR)

ABSTRACT: A special feature of gas-turbines is that the efficiency
            depends on a large number of factors, particularly if the
            circuit is complicated. Various methods have been used to
            determine which of several designs of a gas-turbine will be
            the best.   One of these is the classic auxiliary Lagrange
            factors method.   The extent to which the number of equations
            involved can be reduced is considered.   One method of doing
            this makes use of the so-called "B coefficients method".
            The way in which these B coefficients are related to the
            expression for the total differential of the efficiency is
            explained.   For greater clarity of presentation, auxiliary
            equations are formulated for a two-shaft gas turbine with
            two compressors.   Expressions are derived for the B
Card 1/3   coefficients.   These coefficients become zero at the
            optimum point, facilitating its recognition.   After deriving

SOV/96-58-8-7/22

A Method of Determining the Optimum Parameters of Gas-Turbine
Installations

the equations, two variants of a gas-turbine installation
are compared. The circuits in question are those of
Figs 1a and 1b. The results obtained for one of the
installations are plotted in Figs 2-8. The influence of
the extent of intermediate cooling on the optimum
conditions can be judged from Figs 2-5, and the influence
of the relative internal efficiency of the main sets from
Figs 6-8. Corresponding curves for the second variant
are given in Figs 9-12. The characteristics of the two
sets are compared. It is concluded that when using
B coefficients to determine the optimum parameters of a
gas-turbine installation, it is best to solve a system of
equations. Some are derived from the coupling equations
that characterise special features of the gas turbine
considered; others are derived from some special
additional equations obtained by equating to zero in a
Card 2/3   special way the expressions derived for the B coefficients.

A Method of Determining the Optimum Parameters of Gas-Turbine
Installations

SOV/96-58-8-7/22

The coupling equations can also include expressions for
the specific work per unit of heat and the specific
quantity of heat.

There are 12 figures, and four literature references (Soviet)

ASSOCIATION: Leningradskiy politekhnicheskiy institut (Leningrad
Polytechnical Institute)

1. Gas turbines--Design   2. Mathematics--Applications

Card 3/3

BULANIN, V.I. dots.kand.tekhn.nauk

Optimum parameters of complicated gas-turbine installations, Izv.Vys.
ucheb.zav.; energ. no.8:101-112 Ag '58.   (MIRA 11:11)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina.
                    (Gas turbines)

BULANIN, V.I., dotsent, kand.tekh.nauk, red.

Bibliography. Nauch.-tekh. inform. biul. LPI no.10:96-103 '58.
'58.   (MIRA 14:3)

1. Spravocho-bibliograficheskiy otdel Fundamental'noy biblioteki.
              (Bibliography—Gas turbines)

BULANIN, V.I.

Method for determining the optimum parameters of gas-turbine
installations. Trudy LPI no.193:119-133 '58. (MIRA 12:2)
(Gas turbines)

Bulanin, V. I.

26(1,5);14(0)   PHASE I BOOK EXPLOITATION   SOV/3135

Budyka, Ivan Nikolayevich, Viktor Ivanovich Bulanin, Solomon
    Abramovich Kantor, and Konstantin Georgiyevich Rodin

Atlas konstruktsiy parovykh i gazovykh turbin (Atlas of Steam and
    Gas Turbine Designs) Moscow, Gosenergoizdat, 1959. 9,000 copies
    printed. 1. Opisatel'naya chast' (Part I. Descriptive Part)
    130 p. 2. Chertezhi (Part II. Drawings) 118 p.

Ed.: S. A. Kantor, Professor; Tech. Ed.: A. A. Zabrodina.

PURPOSE: This atlas is intended for students taking advanced courses
    in turbine design. It may also be useful to personnel of design
    offices in plants and planning organizations.

COVERAGE: Drawings and descriptions of basic types of Soviet steam
    and gas turbines are presented. Rated capacities and such
    auxiliary equipment as surface condensers and steam-jet ejectors
    are discussed. Book I contains the descriptions and general in-
    formation for each turbine type, while Book II contains the
    drawings. The drawings in Book II correspond to the turbine types
    listed in Book I. For Part I of the text the corresponding
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Atlas of Steam (Cont.)

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drawings are found on Sheets 1-1 to 1-21 on pages 3 to 23 in
Book II. For Part II the drawings are on Sheets 2-1 to 2-26
on pages 24 to 61; for Part III, Sheets 3-1 to 3-4 on pages
57 to 61; for Part IV, Sheets 4-1 to 4-25 on pages 62 to 89;
for Part V, Sheets 5-1 to 5-10 on pages 90 to 101; and for
Part VI, Sheets 6-1 to 6-17 on pages 102 to 118. The following
are expansions of the three-letter designations of turbine types
listed, indicating the plant where they are designed or manu-
factured: LMZ, Leningradskiy metallicheskiy zavod (Leningrad
Metal Plant); KhTZ, Khar'kovskiy turbinnyy zavod imeni S.M. Kirova
(Khar'kov Turbine Plant imeni S. M. Kirov); UTZ, Ural'skiy
turbomotornyy zavod (Sverdlovsk Ural'skiy Turbine Plant); NZL,
Nevskiy mashinostroitel'nyy zavod imeni V.I. Lenina (Leningrad
Nevskiy Machinery Plant imeni V. I. Lenin); and KTZ, Kaluzhskiy
turbinnyy zavod (Kaluzhskiy Turbine Plant). The atlas was com-
piled by members of the Turbine Construction Department, Lenin-
gradskiy politekhnicheskiy institut imeni M. I. Kalinina (Leningrad
Polytechnical Institute imeni M. I. Kalinin. I. N. Budyka wrote
Parts III and IV; V.I. Bulanin wrote Part 1, Paragraphs 10, 11,
and 13 of Part II, and Paragraph 18 of Part IV; S. A. Kantor
wrote Part VI; and K. G. Rodin wrote Parts II and V. The authors
Card 2/7

Atlas of Steam (Cont.)   SOV/3135

thank Professor A. V. Shcheglyayev, Corresponding Member, Academy
of Sciences, USSR, for reviewing the manuscript. There are no
references.

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Atlas of Steam (Cont.)   SOV/3135

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Atlas of Steam (Cont.)

Part VI. Turbine Governing

AVAILABLE: Library of Congress
Card 7/7

VK/ec
3-15-60

BULANIN, V.I., kand.tekhn.nauk dots.

Scientific technical conference on power machinery manufacture.
Izv.vys.ucheb.zav.; energ. 2 no.9:138-140 S '59.
(MIRA 13:2)

1. Leningradskiy politekhnicheskiy institut im. M.I.Kalinina.
(Power engineering--Congresses)

8(6), 14(6), 26(1)   SOV/143-59-4-11/20

AUTHOR: Bulanin, V.I., Candidate of Technical Sciences

TITLE: Analysis of the Operation Cycle of an Ideal Gas Tur-
               bine

ABSTRACT: An examination of the cycle of an ideal gas turbine,
               which is essentially the solution of one of the prob-
               lems in the field of thermodynamics of reversible
               circling processes, is especially interesting because
               it , that it shows fundamental peculiarities of gas
               turbines. The investigation of the ideal cycle is
               also of practical importance, because it makes it pos-
               sible to draw important conclusions on the role
               and influence of aspects of various kinds, which are
               relevant to the real gas turbine such as the economy
               and the efficiency. The article mainly deals with an
               examination of the efficiency η and the factors deter-
               mining the efficiency of the gas turbine. Such fac-
Card 1/3   tors are: δ = degree of compression; μ = degree of

Analysis of the Operation Cycle of an Ideal Gas Turbine $\quad$ SOV/143-59-4-11/20

regeneration; τ = relation of the gas temperature before the compressor and before the turbine; m = a certain function of iso-entropy k (m = $\frac{k-1}{k}$). The article gives an equation for the efficiency η of an ideal gas turbine with regeneration. This equation, in which η is a function of σ, μ, τ, m, is now examined in regard to different conditions of operation. As the working of the gas turbine depends mainly on the factors σ, μ, τ, and m, it is sufficient to vary these and to determine their influence on the efficiency of the plant. All the equations, which are set up when these parameters are variated, are given in the article. In addition the article contains three diagrams of the degree of compression and efficiency, with a varying degree of regeneration, one diagram of the degree of compression and regeneration with a varying τ, and one η-μ diagram for a variable τ.

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SOV/143-59-4-11/20

Analysis of the Operation Cycle of an Ideal Gas Turbine

There are 3 diagrams and 2 graphs.

ASSOCIATION: Leningradskiy politekhnicheskiy institut imeni M.I. Kalinina(Leningrad Polytechnic Institute imeni M.I. Kalinin)

Card 3/3

BuLANIN V.I.

PHASE I BOOK EXPLOITATION   SOV/3909

Leningrad. Politekhnicheskiy Institut

Energomashinostroyeniye (Power-Machinery Construction) Moscow, Mashgiz, 1960. 163 p. (Series: Its: Trudy, No. 204) Errata slip inserted. 1,600 copies printed.

Sponsoring Agency: RSFSR. Ministerstvo vysshego i srednego spetsial'-nogo obrazovaniya.

Resp. Ed.: V.S. Smirnov, Doctor of Technical Sciences, Professor; Ed.: V.I. Bulanin, Candidate of Technical Sciences, Docent; Tech. Ed.: P.S. Prusakin; Managing Ed. for Literature on the Design and Operation of Machinery (Leningrad Division, Mashgiz): P.I. Pal'-sov, Engineer.

PURPOSE: This book is intended for workers at scientific research institutes and factory design offices. It may also be useful to students of advanced courses and aspirants specializing in power-machinery construction.

COVERAGE: This collection of 17 articles deals with analyses of gas-turbine installations and theoretical and experimental in-vestigations of the operation of power and transportation machinery, including turbines, compressors, and internal-combustion engines. A description is given of recent theoretical and experimental in-vestigations undertaken by the Department of Power-Machinery Con-struction, Leningrad Polytechnical Institute. The investigations include analyses of parameters for insuring high accuracy of operation and the per-fecting of methods of calculating and designing new power equip-ment. References follow several of the articles.

AVAILABLE: Library of Congress

Card 5/5   AC/pw/jb
2-1-60

BULANIN, V.I., kand.tekhn.nauk, dotsent

Scientific and technical conference on the manufacture of electric power machinery. Izv.vys.ucheb.zav.; energ., 5 no.5:130-132 My '62.

(MIRA 15:5)

(Electric machinery industry—Congresses)

BULANIN, V.I., kand.tekhn.nauk, dotsent

"Fundamentals of blading design for steam and gas turbines"
by A.M. Zavadovskii. Reviewed by V.I. Bulanin.
Energomashinostroenie 8 no.5:43-44 My '62.   (MIRA 15:5)
(Turbines--Blades)
(Zavadovskii, A.M.)

BULANIN, V.I.

Concerning the degree of moisture in a two-phase flow. Trudy
LPI no.221:85-102 '62.   (MIRA 15:9)
                        (Steam)

BULANIN, V.I.

An outstanding inventor. Trudy LPI no.221:187-189 '62.

(MIRA 15:9)

(De Laval, Carl-Gustav Patrik, 1845-1913)

GEL'FENBEYN, L.G., kand. tekhn. nauk; BULANIN, V.I., kand. tekhn.
    nauk, retsenzent; MELEYEV, A.S., inzh., red.; PALEYEV,
    N.M., inzh., red. izd-va; GORDEYEVA, L.P., tekhn. red.

[Regenerators of gas-turbine systems]Regeneratory gazoturbin-
nykh ustanovok. Moskva, Mashgiz, 1963. 177 p. (MIRA 16:4)
                    (Gas turbines)

BULANIN, V.I.

Local degree of humidity of a two-phase three-dimensional
flow. Trudy LPI no.228:27-35 '63.   (MIRA 17:1)

L 40283-65   EWT(1)/EWP(m)/EWA(d)/FCS(k)/EWA(1)   Pd-1
ACCESSION NR: AT5003387   S/2563/64/000/232/0037/0041

AUTHOR: Bulanin, V. I.

TITLE: The direction of biphasic flow components

SOURCE: Leningrad. Politekhnicheskiy institut. Trudy, no. 232, 1964. Turboma-
shiny (Turbomachines), 37-41

TOPIC TAGS: biphasic flow, flow component direction, wet steam

ABSTRACT: The analytic determination of the direction of motion of the components
of a biphasic flow (e.g., the direction of the vapor and liquid phases in wet
steam) has not yet been solved. In the absence of any other foreseeable solution,
the author discusses the applicability of a simple device having some kind of open-
ing intercepting the flow of mixed vapor and liquid at angles α_v and α_1, respective-
ly (see Fig. 1 of the Enclosure). He shows that one can establish a system of
equations connecting these angles with the cross section of the opening, the den-
sities of the respective phases, and the local gravimetric humidity measured for
three orientations of the opening with respect to the given flow. The author notes
that the accuracy of the proposed device will depend greatly on the construction

Cord   1/2

L 40283-65

ACCESSION NR: AT5003387

of short calorimetric devices which will not significantly disturb the original flow. Orig. art. has: 9 formulas and 1 figure.

ASSOCIATION: Leningradskiy politekhnicheskiy institut imeni M. I. Kalinina (Leningrad polytechnic institute)

SUBMITTED: 00

NO REF SOV: 000

ENCL: 01

OTHER: 000

SUB CODE: ME, PR

Card 2/3

BULANIN, V.I.; GUR'YEV, V.P. [deceased]; RIS, V.F.

Konstantin Ivanovich Strakhovich, 1904-; on the occasion of his 60th birthday. Trudy LPI no.237:82-87 '64.

(MIRA 18:4)

BATISHCHEV, K.N., inzh.; BULANKIN, A.I., inzh.; GAL'PERN, M.L., inzh.

Concerning the use of VVN-220 air cutouts. Elek. sta. 33 no.6: 53-56 Je '62.

(Electric cutouts)   (MIRA 15:7)

BUIANKIN, I.M., akademik

Contributions of our university teachers. Nauka i zhyttia
10 no.1:56 Ja '60.   (MIRA 13:6)

1. Rektor Khar'kovskogo gosudarstvennogo universiteta im.
A.M.Gor'kogo AN USSR.
                (Kharkov—Research)

... Use of adsorption ...

dyestuffs have been studied. A highly specific
method of detecting traces of I' in the presence of
very large amounts of Cl' and Br' and a method
of detecting Br', Cl' and SCN' are given. The
adsorption reactions for SO₄'' and P' and adsorption
reactions for HPO₄'', WO₄, MoO₄, benzoate and
p-chlorobenzoate are described.   O. E. S.

BULANKIN, I.N.   DECEASED   *1962*
                                  31 OCTOBER 1960

                                  SEE IIC

BIOCHEMISTRY

PSHENICHNYY, I.P.; BULANKIN, M.I. (Khabarovsk)

Attachemnt to the electrocardiograph for continuous registra-
tion of heart rhythm on the kymogram. Pat. fiziol. i eksp.
terap. 6 no.6:72-73 N-D'62   (MIRA 17:3)

1. Iz Khabarovskogo meditsinskogo instituta.

ABSTRACT: Observations of selective surface oxidation on germanium crystals with
surface imperfections and with unevenly distributed inclusions have been conducted.
This type of oxidation had been previously observed near scratches and other
macrodefects (V. N. Maslov and L. V. Nabatova. Kristallografiya, 5, 3, 470-472,
1960). Surface regions near the dislocation lines are also subject to local
oxidation. Germanium specimens alloyed with arsenic exhibit a grayish irridescent
film after being polished in a 1:1 mixture of HF and HNO_3 and etched in basic
ferrocyanide. This film, however, appears to be missing near the etched pits when

Card 1/2

ACCESSION NR: AP4012288

viewed through a microscope. The oxidation zones are seen to follow the variations in the intensity of electrical potential on the surface, and both phenomena may be explained as being related to the concentrations of arsenic at the dislocations. For the same reason no oxidation is found near the twinning lines which act similarly to the dislocation concentrations. The relation of selective oxidation to the distribution of admixtures is confirmed by the observation of crystals with traces of layered growth. Here the oxidized zones have a banded appearance caused by the layered concentration of arsenic inclusions. In the case of antimony inclusions in germanium, the zones of oxidation assume a spotty distribution of unexplained origin. Orig. art. has: 5 photographs.

ASSOCIATION: Gosudarstvenny*y nauchno-issledovatel'skiy i proyektny*y institut redkometallicheskoy promy*shlennosti (State Scientific Research and Design Institute of Rare Metals Industry)

SUBMITTED: 05Mar63   DATE ACQ: 19Feb64   ENCL: 00

SUB CODE: PH, ML   NO REF SOV: 001   OTHER: 003

Card 2/2

BULANKIN, Yu.S.

Ultrasonic dispersing of powdery objects for electron microscope studies. Zav. lab. 27 no. 12:1501-1502 '61.   (MIRA 15:1)

1. TSentral'nyy nauchno-issledovatel'skiy kotloturbinnyy institut im. I.I. Polzunova.

(Steel—Metallography) (Electron microscopy)

BULANKIN, Yu.V.

Operating hydraulic transmissions of the TGM-1 diesel locomotives at the Moscow "Serp i Molot" Plant. Biul. tekh.-ekon. inform. Gos. nauch.-issl. inst. nauch. i tekh. inform. 18 no.10:44-45 O '65.
(MIRA 18:12)

BULANKINA, M. M.; YAKOVLEV, B. V.; GOLUBINTSEVA, A. P.
DZHIYEMBAYEV, Zh. T.; ZNAMENSKIY, V. S.

Coordination conferences. Zashch. rast. ot vred. i bol. 5
no.5:57-61 My '60.   (MIRA 16:1)

(Plants, Protection of—Congresses)

BULANKOV, L.V., inzh., red.; MEDVEDEVA, M.A., tekhn. red.

[Innovators, operators of diesel locomotives; collection of
articles] Novatory - teplovozniki; sbornik statei. Moskva, Vses.
izdatel'sko-poligr. ob"edinenie M-va putei soobshcheniia, 1960.
61 p.   (MIRA 14:10)
   (Railroads—Employees) (Diesel locomotives—Technological innovations)

BULANKOV, L.V., inzh.

Increasing the effectiveness of the use of new traction types.
Zhel.dor.transp. 42 no.10:10-16 O '60.   (MIRA 13:10)
        (Railroads--Traffic)   (Locomotives)

BULANKOV, L.V.

Expansion of the use of diesel traction in 1962. Elek.i tepl.
tiaga 6 no.2:1-2 F '62.   (MIRA 15:2)

1. Nachal'nik otdela ekspluatatsii Glavnogo upravleniya
lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
                         (Diesel locomotives)

VOROB'YEV, I.Ye.; BULANKOV, L.V.

Make full use of the potentials for increasing the efficiency of electric and diesel traction. Elek.i tepl.tiaga 6 no.5:1-3 My '62.

(MIRA 15:6)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya (for Vorob'yev).
2. Nachal'nik otdela ekspluatatsii Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya (for Bulankov).

(Electric locomotives)   (Diesel locomotives)

SYTSKO, F.A.; GUTKOVSKIY, V.A.; PODCHUFAROV, M.S.; BULANKOV, L.V.
    inzh., retsenzent; MAMCHENKO, V.P., inzh., red.;
  , DROZDOVA, N.D., tekhn. red.

[Shift crew method in the operation of locomotives;
experience of the White Russian Railroad] Smennaia ezda
na parovozakh; opyt Belorusskoi dorogi. Moskva, Trans-
zheldorizdat, 1963. 56 p.   (MIRA 16:12)
        (White Russia—Railroads—Management)

BULANKOV, L.V., inzh.

Potentials for increasing the efficiency in the utilization of
locomotives. Zhel. dor. transp. 45 no.5:31-34 My '63.
(MIRA 16:10)

1. ULANKOVA, A.M.

2. USSR (600)

4. Bee Culture

7. Young apiculturists. Pchelovodstvo. 29. no. 11. 1952.

9. **Monthly** **List** **of** **Russian** **Accessions**, Library of Congress, February 1953. Unclassified.

BULANOV, A.

New apparatus. Pozh. delo 7 no. 1:24 Ja '60.   (MIRA 14:2)

1. Starshiy master pozharno-ispytatel'noy stantsii Upravleniya
pozharnoy okhrany Mosgorispolkoma.
      (Fire extinction--Chemical systems)

BULANOV, A.; VAL'CHUK, A.

In Kiev after the liberation. Voen. znan. 40 no.12:14-15 D'62
(MIRA 18:1)

BULANOV, A.

    For the native city. Voen. Znan. 41 no.5:13 My '65.   (MIRA 18:5)

BULANOV, A. (Kiyev)

They want to speak to you, Alesha... Voen.znan. 41 no.11:12-13 N '65.
(MIRA 18:12)

BULANOV A.A.

BAZANOV, A.F., kandidat tekhnicheskikh nauk, laureat Stalinskoy premii;
    BULANOV, A.A., inzhener.

Wear of friction clutches and brakes. [Trudy] VNIISTROIDORMASH
no.5:61-77 '52.   (MLRA 7:11)
        (Clutches (Machinery)) (Mechanical wear)

VOLKOV, D.P., kandidat tekhnicheskikh nauk; BULANOV, A.A., inzhener.

Friction and wear tests of friction linings in excavator clutches.
[Trudy] VNIIStroidormash no.15:63-72 '57.   (MLRA 10:6)
                (Clutches (Machinery)--Testing)

BULANOV, A.A., inzh.

New material for making excavator friction clutch linings. Stroi.
i dor. mashinostr 3 no.5:13-15 My '58.   (MIRA 11:6)
               (Clutches (Machinery))

BULAHOV, A.A., inzh.

Improving the design of clutches and brakes of universal crane
excavators. Stroi. i dor. mashinostr. 4 no.3:9-11 Mr '59.
(MIRA 12:4)
(Excavating machinery—Equipment and supplies)

REYSH, A.K., inzh.; BULANOV, A.A., inzh.

Using capron bushes to support rollers of the crawler tread
of excavators. Stroi.i dor.mashinostr. 4 no.9:37-38 S '59.
(MIRA 12:11)

(Nylon) (Crawler vehicles)

AVER'YANOV, L.I.; inzh.; BULANOV, A.A., inzh.; FEDOROV, A.P., inzh.;
        KHLOPOTOV, N.N., inzh.

All-purpose excavator mounted on a self-propelled chassis. Stroi.
i dor.mashinostr. 5 no.7:3-5 Jl '60.   (MIRA 13:7)
                (Excavating machinery)

BERKMAN, I.L.; BULANOV, A.A.; YEREMENKO, K.P.; SKVORTSOV, G.S.

Single bucket excavator with hydraulic drive. Gor. zhur.
no.11:73 N '63.   (MIRA 17:6)

DONSKOY, S.M.; ZEMSKOV, N.Ya.; OSENOV, V.I.; POTAPOV, A.I.;
    UDALIKHINA, A.S.; YAROSHUK, D.Ya.; VAYNER, M.S.; VERNYI,
    Ye.A.; CHURKIN, D.I.; GERASIMOV, K.A.; ZIBRIN, D.A.;
    AYKHENVAL'D, Ye.L.; KOZLOV, A.I.; BULANOV, A.G.;
    OSTROVSKAYA, L.N.; TAUBES, I.S.; PETROV, Z.I.; POTEPALOV,
    V.A.; PECHONYY, A.D.; TROFIMOVA, A.S., tekhn. red.

[Development of power engineering in the Tatar A.S.S.R.]
Razvitie energetiki Tatarskoi ASSR. Kazan', Tatarkoe knizhnoe
izd-vo, 1961. 145 p.   (MIRA 15:2)

1. Tatar A.S.S.R. Sovet Narodnogo khozyaystva. Upravleniye
energeticheskoy promyshlennosti.
                (Tatar A.S.S.R.—Power engineering)

BULANOV, A.G., inzh.

Burning of crude oil in the furnaces of TP-170 boilers. Elek.
sta. 32 no.1:86-87 Ja '61.   (MIRA 16:7)

(Boilers)   (Petroleum as fuel)

BULANOV, A.G., inzh.

Experience in burning crude oil. Elek. stat. 35 no.1:85-86
Ja '64.
(MIRA 17:6)

L 14154-66
ACC NR: AP6001315

SOURCE CODE: UR/0248/65/000/009/0037/0040

AUTHOR: Bochkov, N. P.; Antoshchina, M. M.; Bulanov, A. G.; Khlestova, R. A.;
Sevan'kayev, A. V.

ORG: Institute of Medical Radiology, AMN SSSR, Obninsk (Institut meditsinskoy /7
radiologii AMN SSSR); Maternity Hospital No. 26, Moscow (Rodil'nyy dom No. 26) /3

TITLE: Frequency of spontaneous noncleavage of sex chromosomes in man

SOURCE: AMN SSSR. Vestnik, no. 9, 1965, 37-40

TOPIC TAGS: human genetics, infant disease

ABSTRACT: An examination was made for the presence of sex chromation in cells from
newly born girls and boys. No anomalies were found in the girls, while four of the
boys had sex chromatin, i. e., Kleinfelter's syndrome. Reexamiation of these four
infants 2-6 months later showed a high percentage of cells with sex chromatin. None
of the infants' parents had been exposed to ionizing radiation or other injurious
factors. Among stillborn infants, 2 of 57 boys and 1 of 46 girls had sex chromosome
anomalies. Referring to the frequency of such anomalies in spontaneous abortions

Card 1/2   UDC: 576.312.332 : 616-053.1+616.053.1 : 576.312.332

L 14154-66
ACC NR: AP6001315

reported in the literature, the author suggests that chromosome mutations in man are
eliminated at different stages of ontogenesis; the rate of spontaneous noncleavage
of chromosomes cannot be accurately determined without examining aborted and still-
born infants as well as live-born children. Orig. art. has: 1 figure, 2 tables.

SUB CODE: 06/   SUBM DATE: 05Jun65/   ORIG REF: 009/   OTH REF: 017

Card 2/2

BULANOV, A.I.; IZMAYLOV, P.I.; PETROV, N.A.; TROITSKIY, B.V.; SLOBODCHIKOV,
   D.A., redaktor; LEVCHUK, G.P., redaktor; INOZEMTSEVA, A.I., redaktor;
   KUZ'MIN, G.M., tekhnicheskiy redaktor.

[Topography] Topografiia. Pod obshchei red. D.A.Slobodchikova.
Moskva, Izd-vo geodezicheskoi lit-ry. Pt. 1. 1954. 539 p. [Microfilm]
      (Topographical surveying)   (MLRA 7:11)

BULANOV, A I.

BULANOV, Aleksandr Ivanovich; PESHKOV, Andrey Aleksandrovich; TROITSKIY,
Boris Vladimirovich; SLOBODCHIKOV, D.A., redaktor; LEVCHUK, G.P.,
redaktor; INOZEMTSEVA, A.I., redaktor; KUZ'MIN, G.M., rekhnicheskiy
redaktor

[Topography] Topografiia. Pod obshchei red. D.A.Slobodchikova.
Moskva, Izd-vo Geodezicheskoi lit-ry. Pt.2. 1954. 219 p. [Microfilm]
        (Topographical surveying)   (MLRA 8:3)

BULANOV, A.I.

"Computation methods". E.G.Larchenko. Reviewed by A.I.Bulanov.
Sbor.st.po geod. no.6:61-64 '54.   (MLRA 9:6)
(Approximate computation) (Geodesy) (Larchenko, E.G.)

SUDAKOV,S.G.; ALEKSANDROV,T.F.; BAGROV,M.A.; BULANOV,A.I.; KAMENSKAYA,M.V.;
KUZ'MIN,B.S.; LITVINOV,B.A.;SINYAGINA,M.I.; TIMOFEYEV,A.A.; EHTIN,I.I.;
SINYAGINA,V.I.

[Instructions for class I,II,III and IV leveling] Instruktsiia po
nivelirovaniiu I, II, III i IV klassov. Moskva, Izd-vo geodezicheskoi
lit-ry. 1955. 106 p.
                                                        (MIRA 9:3)

1. Russia (1923- U.S.S.R.)Glavnoye upravleniye geodezii i kartografii.
                        (Leveling)

SUDAKOV, S.G.; ALEKSANDROV, T.F.; BAGROV, M.A.; BULANOV, A.I.; KAMENSKAYA,
    M.V.; KUZ'MIN, B.S.; LITVINOV, B.A.; SINYAGINA, M.I.; TIMOFEYEV, A.A.;
    ENTIN, I.I.; pri uchastii Sinyaginoy,V.I.; BULANOV, A.I., red.;
    ROMANCVA, V.V., tekhn.red.

[Instructions for first, second, third and fourth class leveling]
Instruktsiia po nivelirovaniiu I, II, III i IV klassov. Izd. 2-oe,
ispr. i dop. Moskva, Izd-vo geodez. lit-ry, 1957. 106 p.
                                              (MIRA 11:4)

1. Russia (1923-   U.S.S.R.) Glavnoye upravleniye geodezii i
kartografii.
            (Leveling)

BULANOV, /..I.; TROITSKIY, B.V.

Experimental research work conducted in aerial geodetic surveying establishments. Geod. i kart. no.4:3-8 Ap '57.   (MIRA 10:8)
                              (Aerial photogrammetry)

SUDAKOV, S.G.; ALEKSANDROV, T.F.; BAGROV, M.A.; BULANOV, A.I.; KAMENSKAYA,
M.V.; KUZ'MIN, B.S.; LITVINOV, B.A.; SINYAGINA, M.I.; TIMOFEYEV,
A.A.; ENTIN, I.I.. Prinimala uchastiye SINYAGINA, V.I.. ROMANOVA,
V.V., tekhn.red.

[Instructions for first-, second-, third-, and fourth-order leveling]
Instruktsiia po nivelirovaniiu I, II, III i IV klassov. Izd.3, ispr.
i dop. Moskva, Izd-vo geod.lit-ry. 1959. 111 p.   (MIRA 13:3)

1. Russia (1923- U.S.S.R.) Glavnoye upravleniye geodezii i karto-
grafii.
        (Leveling--Handbooks, manuals, etc.)